B. CIRCULATION

Introduction

The circulation network structures the pattern and flow of pedestrians and vehicles at the Laboratory. It determines routes and travel modes in which people, goods and services access and traverse the site. The circulation network also plays a crucial role in the Laboratory's emergency response system.

The Laboratory's circulation network is composed of pedestrian, bicycle and vehicular systems.

Principles

Design principles for the circulation network are:

- The circulation network should be a balanced transportation network that accommodates pedestrians, bicycles, transit and automobiles.
- The circulation network should incorporate emergency response needs into the design of the network and its components.
- Streetscape, landscaping, signage, lighting, security and safety needs should be integrated into the design standards for the circulation network.
- The circulation network should coordinate and link with off-site pedestrian, bicycle, transit and vehicular systems of the State of New Mexico, Los Alamos County, and others entities that are contiguous with the Laboratory.

References

The following Laboratory standards or guidelines should be referenced when planning or designing parts of the circulation network. Where conflicts occur between standards, the project manager will determine the applicable standard.

CSP
Comprehensive Site Plan 2000 and supplement CSP 2001

ADP
Area Development Plans

ESM
LANL Engineering Standards Manual

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1. Roads

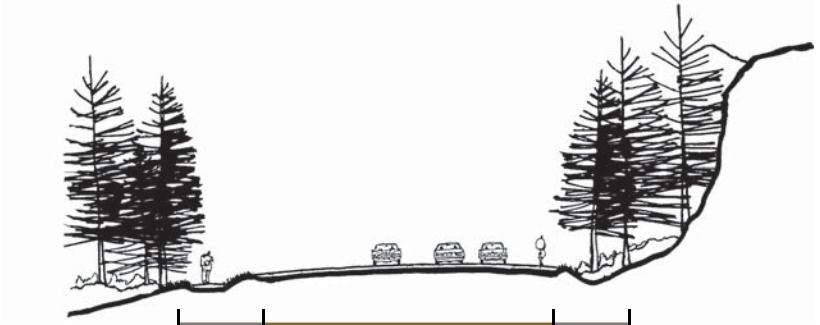
A clear road hierarchy is a crucial part of overall Laboratory circulation. This section describes the road classifications that make up this hierarchy. Roads are a highly visible part of the Laboratory environment. Their design greatly impacts staff and visitor security, safety and impression of the Laboratory.

This section provides supplemental information for:

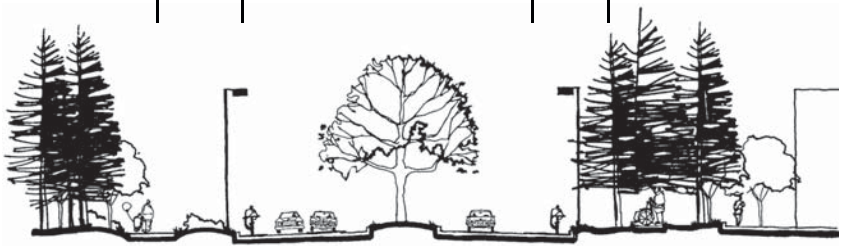
Table XXX, B.1 Circulation / Roads.

Major Arterial - Edge
Major Arterial - Center
Collector -Transit
Collector
Local Street
Service-Emergency Access Roads

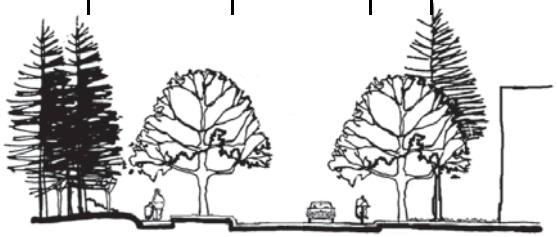
Figure XXX: Road Classification Comparison



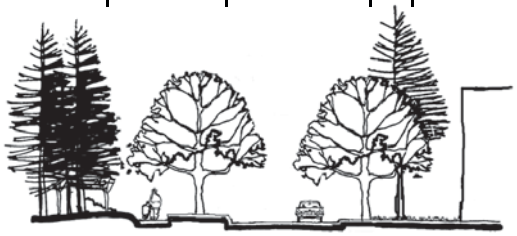
MAJOR ARTERIAL - EDGE ..... road bed ..... total road easement = 100’ - 120’



MAJOR ARTERIAL - CENTER ..... road bed road bed ..... total road easement = 100’ - 120’



COLLECTOR ..... road bed ..... total road easement = 60’ - 80’



LOCAL STREET ..... road bed ..... total road easement = 50’

a. Major Arterial - Edge

Major arterials in "edge" locations connect from the perimeters of the Laboratory to the core areas. They often extend through undeveloped areas and are the primary vehicular links between dispersed tech areas.

These arterials are designed to accommodate significant traffic volumes and be primary emergency evacuation routes. The landscape standards for this road classification emphasize retaining the existing landscape and using native plant materials to enhance the natural setting.

Final design speeds and roadway classifications are determined by the Laboratory Traffic Control Engineer. For the purposes of this document, *See Figure XXX Centers and Edges Key Map* to determine the general classification that a roadway falls into.

Roadway standards within this section are supplemental to Laboratory engineering standards. All Laboratory road engineering standards must be met.

Standards

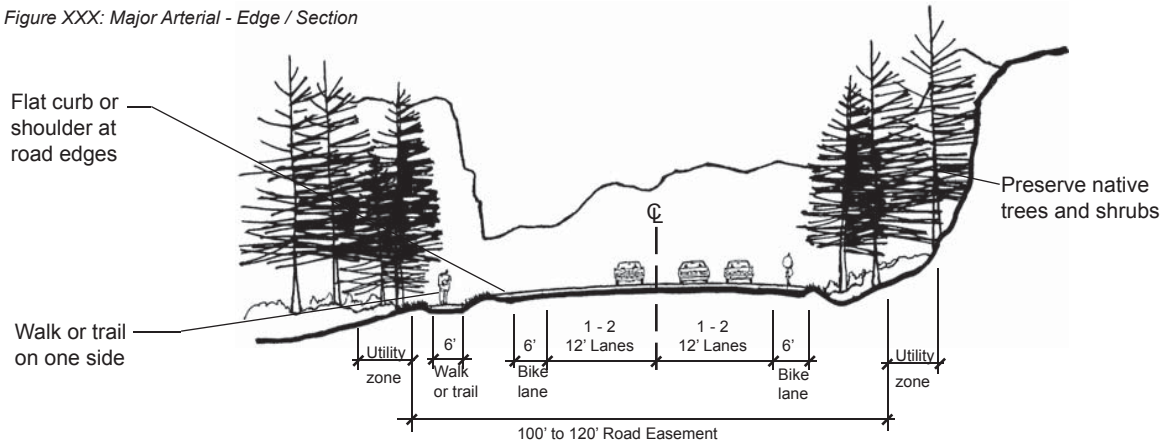
Roadway
- Four traffic lanes
- 100 to 120 ft. wide road easement
- Standard curbing on medians, flat curb or shoulder at edges
- Bike lanes on both road bed edges or separated 10' bike path on one side
- Minimum 6 ft. wide trail or 10' bike path on one side

Intersections
- Provide acceleration, deceleration and left-turn lanes at intersections with arterials & collectors
- Provide striped pedestrian crossings at intersections

Building and Parking Setbacks
- Setback buildings a minimum of 75 ft. from edge of road easement
- Setback parking lots a minimum of 50 ft. from road easement or install landscaping buffer

Landscape
- Revegetate roadsides with native trees, shrubs and grasses
- Accent intersections with extremely drought tolerant or native plants

Figure XXX: Major Arterial - Edge / Section



b. Major Arterial - Center

Major arterials in "center" locations are in important visitor and public access routes. They are to be designed to create quality urban streetscapes.

"Center" major arterials are integral to the safety and security plans of the Laboratory. They route high-volume traffic away from secure scientific locations within the core planning area. Major directional signage and prominent pedestrian, bike and transit improvements and landscaping are crucial design features of this road type.

Standards

Roadway
- Four lanes of traffic
- 100 to 120 ft. wide road easement
- Center median, minimum of 16 ft. wide
- Bike lanes on both road bed edges or separated 10' bike path on one side
- Standard curb and gutter
- Minimum 6 ft. wide sidewalks on both sides

Intersections
- Separate intersections - minimum 300 ft. center line to center line
- Provide acceleration, deceleration and left-turn lanes at intersections with arterials & collectors
- Provide medians on the secondary streets that intersect with urban arterials
- Install specialty paving to mark pedestrian crossings

Building and Parking Setbacks
- Setback buildings a minimum 50 ft. from the edge of road easements
- Setback parking lots a minimum of 25 ft. from edge of road easement

Landscape
- Formal arrangement of deciduous shade trees in center median at 30' O.C.
- Informal clusters of evergreens and flowering trees at street edges and to screen parking
- Intersections planted with clusters of flowering trees and flowering shrubs
- Lab monument signage and image features incorporated at selected major intersections
- Transit stops as sited by PM-1

Figure XXX: Major Arterial - Centers / Section

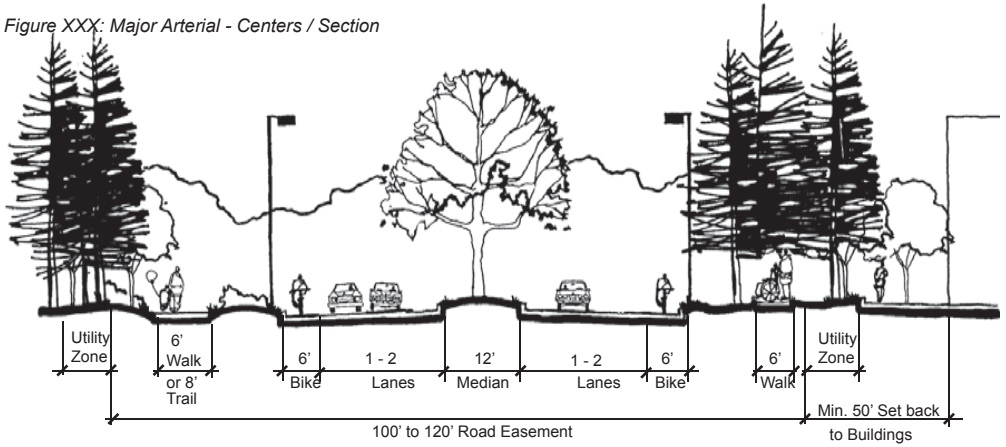


Figure XXX: Major Arterial - Edge / Plan View

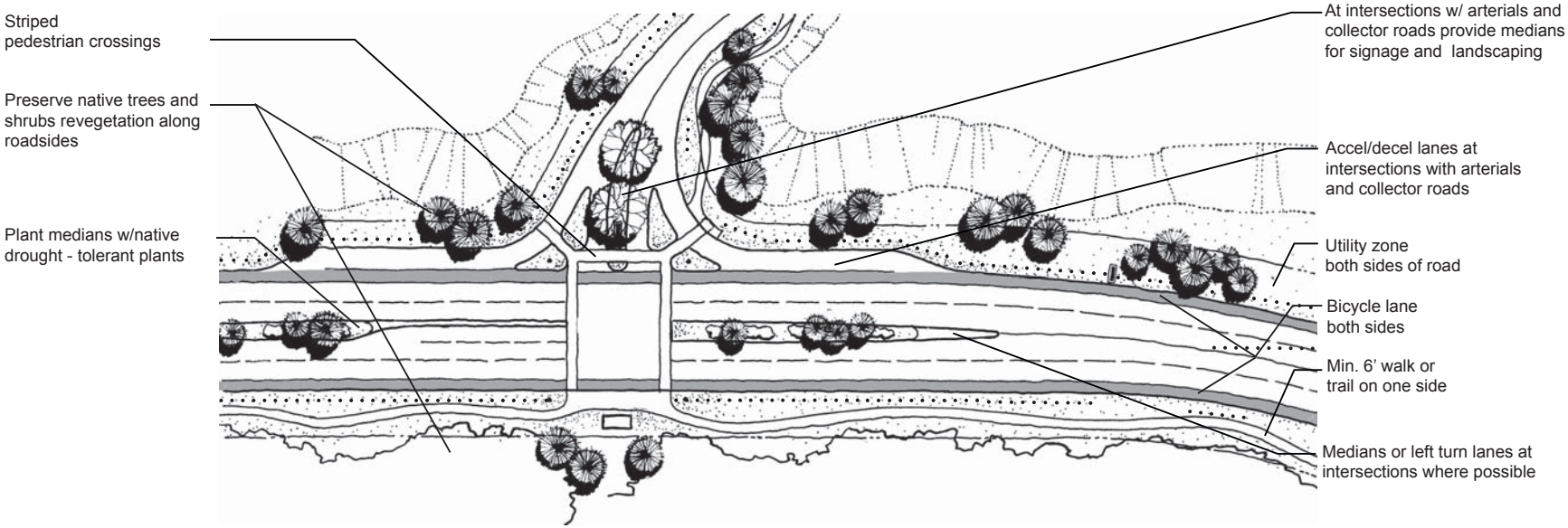
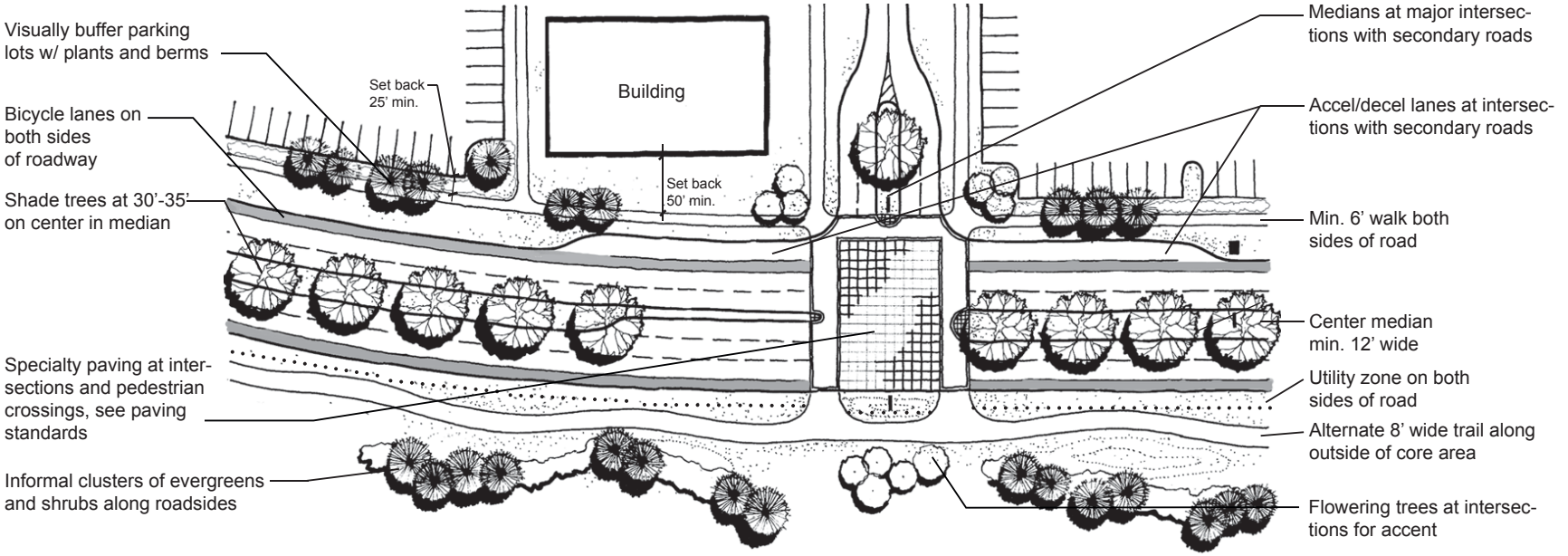


Figure XXX: Major Arterial - Center / Plan View



c. Collector - Transit

Transit collectors are intended as well-developed transit-oriented streets to encourage the use of shuttle or transit systems.

Standards

Roadway
- Two to four lanes, 12 ft. each
- 60 - 80 ft. wide road easement
- Standard curb and gutter at road edges
- Minimum 6 ft. wide sidewalks on both sides

Intersections
- Provide specialty paving at pedestrian crossings
- Provide medians and acceleration/deceleration lanes at intersections with major arterials

Building and Parking Setbacks
- Setback buildings a minimum of 30 ft. from road easement
- Setback parking a minimum 15 ft. from road easement

Landscape
- Shade trees and shrubs in formal pattern

Figure XXX: Transit Collector / Plan View

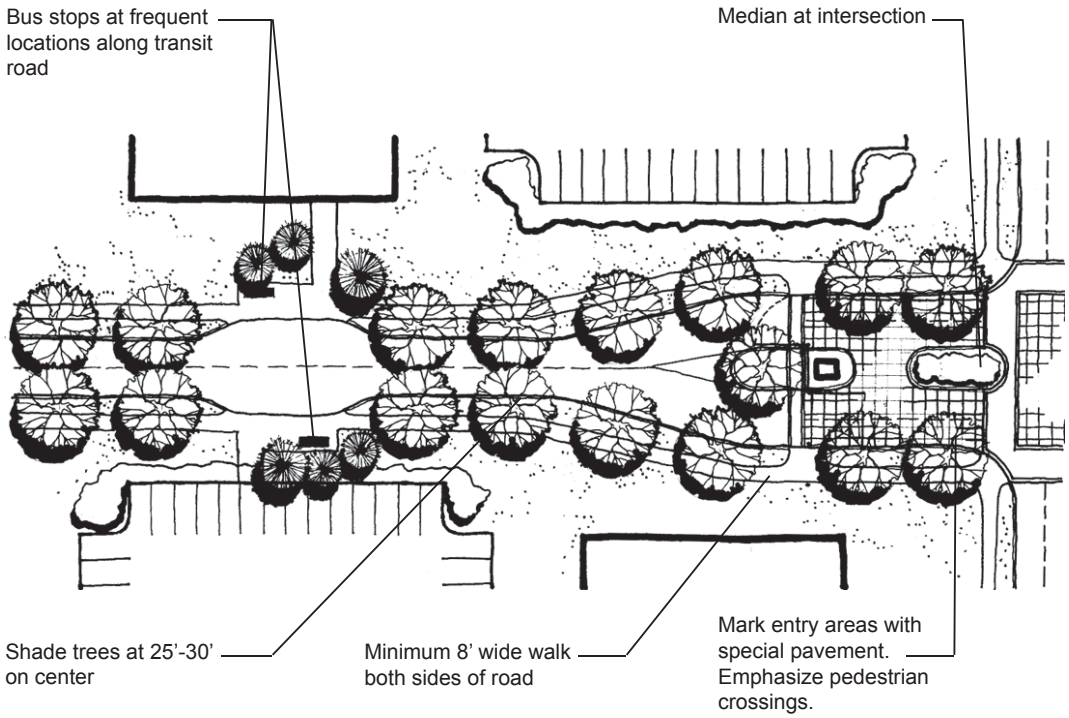
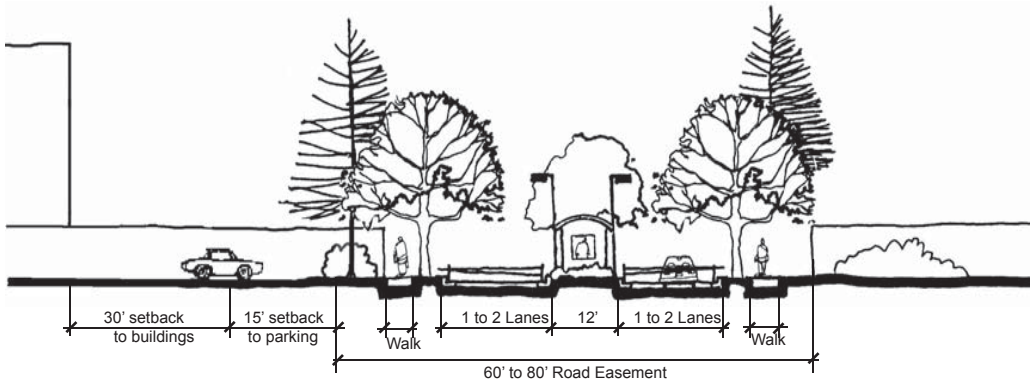


Figure XXX: Transit Collector / Section



d. Collector

Collector roads convey traffic between the Laboratory's major arterials into technical areas. The collector is the highest road classification in most areas outside the TA-03 Core.

Standards

Roadway
- 60 to 80 ft. wide road easement
- Flat curb or shoulder at edges, curb and gutter on medians
- Bike lanes on both road bed edges or separated 10' bike path on one side
- Minimum 6 ft. wide trail or 10' bike path on one side

Intersections
- Provide acceleration and deceleration lanes at intersections with major arterials
- Provide striped intersections and crossings for pedestrians

Building and Parking Setbacks
- Setback buildings a minimum of 30 ft. from road easement
- Setback parking a minimum 15 ft. from road easement

Landscape
- Informal arrangements of deciduous and evergreen trees, incorporating existing vegetation where possible

Figure XXX: Collector Roadway / Plan View

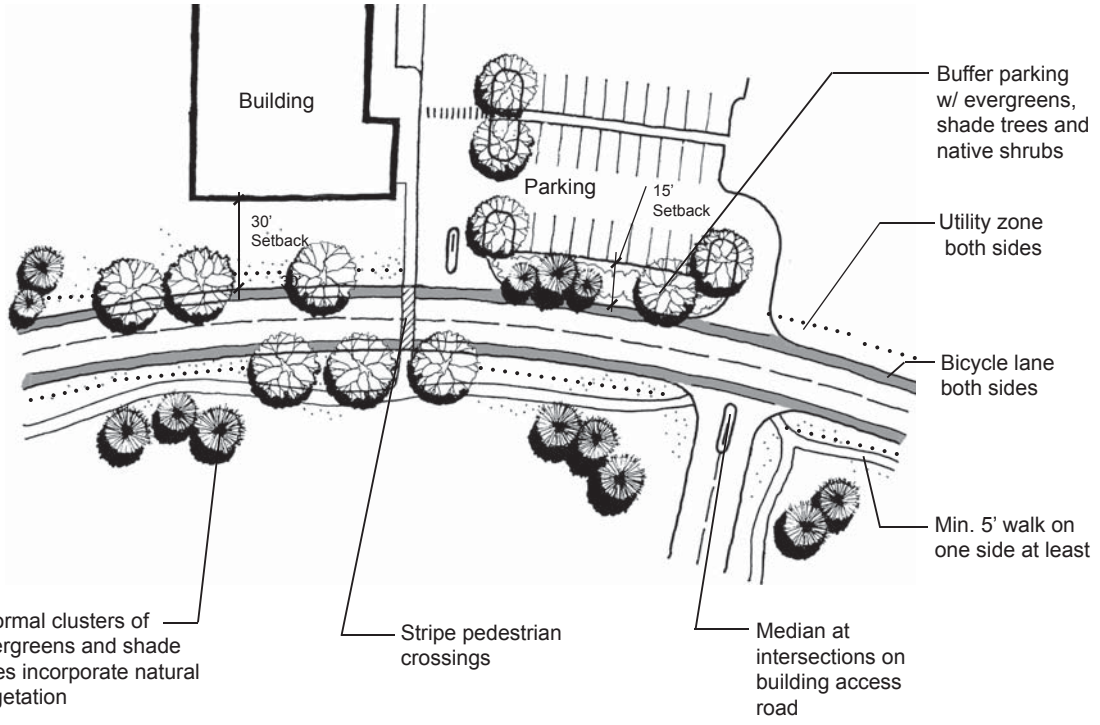
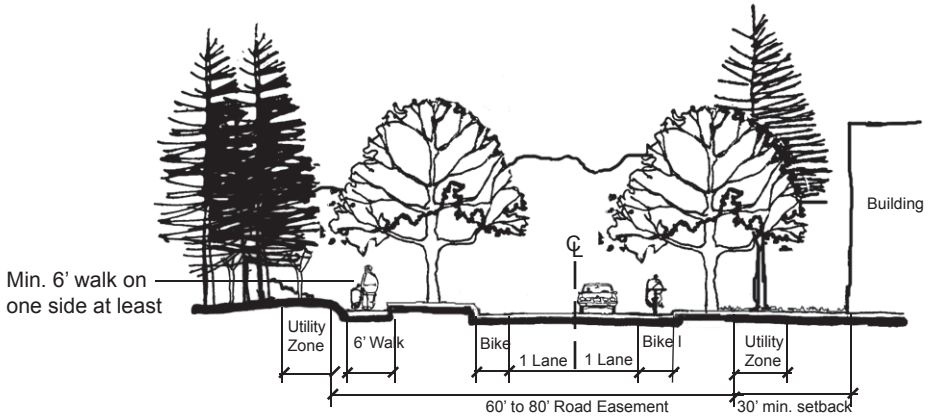


Figure XXX: Collector Roadway / Section



e. Local Street

Local streets are intended to compliment pedestrian scaled and more developed settings at the Laboratory.

Standards

Roadways
- 50 ft. wide minimum road easements
- Standard curb and gutter at road edges
- Minimum 6 ft. wide sidewalk on one side

Intersections
- Provide specialty paving at pedestrian crossings

Building and Parking Setbacks
- Setback buildings a minimum of 25 ft. from road easement
- Setback parking a minimum 10 ft. from road easement

Landscape
- Center: Formal arrangement of deciduous trees along street edges
- Edge: Informal arrangements of deciduous and evergreen trees, incorporating existing natural vegetation where possible
- Mix of flowering, shade and evergreen trees and shrubs to buffer parking lots along streets

Figure XXX: Local Street / Plan View

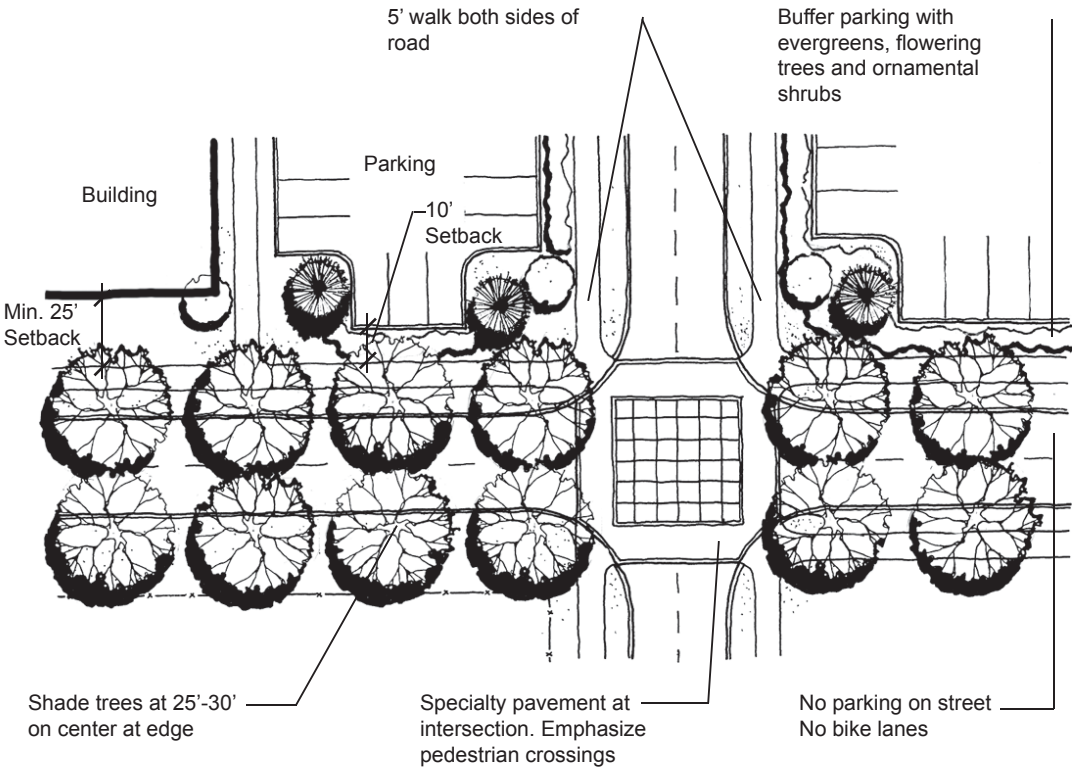
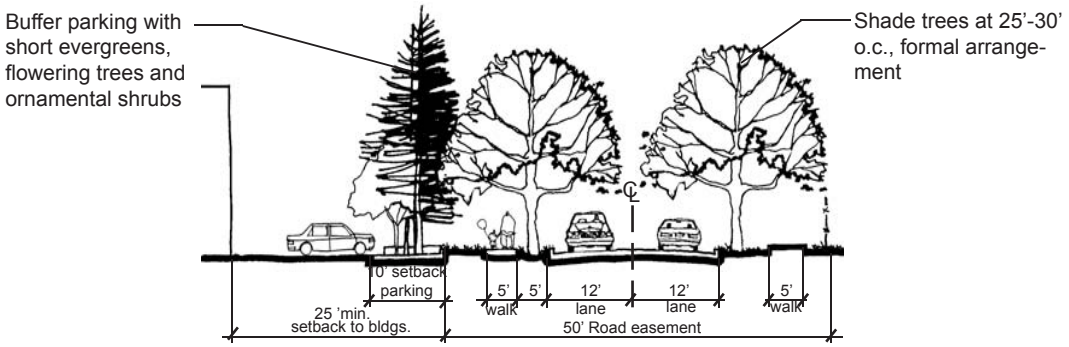


Figure XXX: Local Street / Section



f. Service-Emergency Access Roads

Service and emergency access roads provide maintenance, service and secondary emergency access. They are used primarily by maintenance and delivery personnel.

Standards

Roadway
- 20 ft. wide minimum road easement
- Minimum 12 ft. road bed (normally paved, except in low traffic area)
- Minimum 16 ft. vertical clearance above road
- Reverse crown allowed with approval
- Under 5.0 % grade in travel direction and maximum 2.0% cross slopes
- Turning radii as per needs of service and emergency vehicles
- No on-street parking
- Provide service/emergency access signage

Intersections
- Provide safety mirrors or other safety aids at intersections with inadequate clear sight triangle
- Stripe pedestrian crossings

Building and Parking Setbacks
- Setback buildings a minimum of 5 ft. from road easement
- Setback parking a minimum 5 ft. from road easement

Figure XXX: Service-Emergency Access Road / Plan

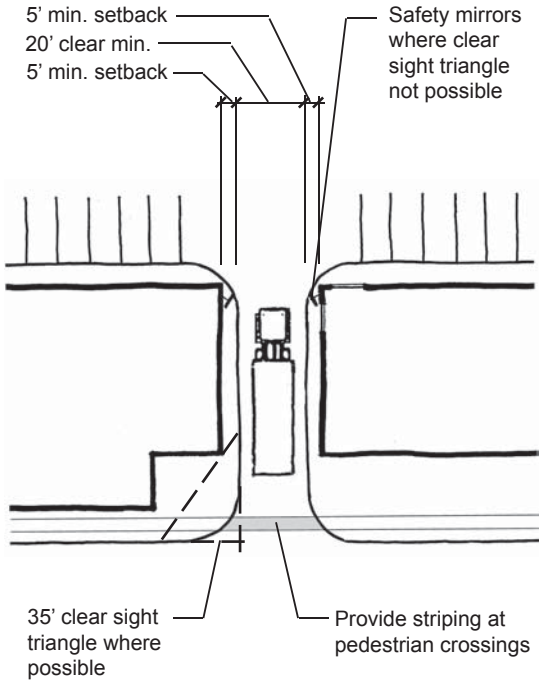


Figure XXX: Service-Secondary Access Road / Section

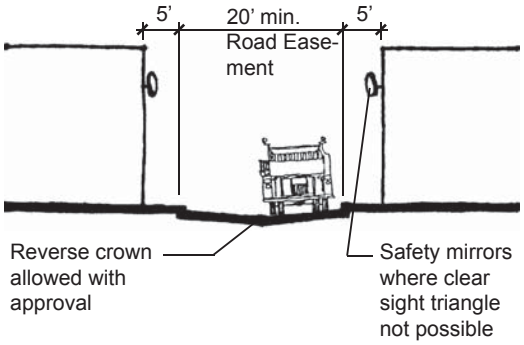


Figure XXX: Fire Truck Turnaround

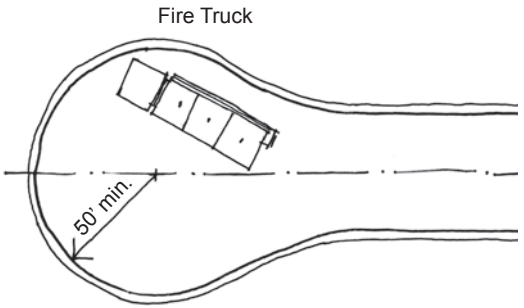
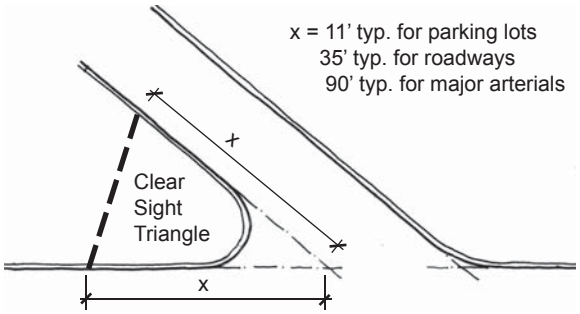


Figure XXX: Clear Sight Triangle



ROADS

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2. Parking

Parking is a major land use at the Laboratory and should be designed with careful consideration to mediate its visual and environmental impacts. This section addresses both surface parking and parking structures.

This section provides supplemental information for:

Table XXX, B.2 Circulation / Parking.

- **Surface Parking**
  - **Large Lots**
  - **Small Lots**
- **Parking Stalls**
- **Service Areas**
- **Parking Structures**

a. Surface Parking

The Laboratory's guiding concept is to move parking to the perimeter of developed areas and to encourage transit use from the parking areas to the building clusters. This creates opportunities to develop a denser, walkable and more secure Laboratory environment and allows for transit efficiency and viability. Smaller connected parking lots instead of single large lots should always be encouraged.

Figures XXX and XXX illustrate improvements possible through the application of the standards to a large parking lot. *Figures XXX and XXX* illustrate improvements possible through application of the standards on a small parking lot.

General Parking Area Design Standards

Layout *(See Figures XXX and XXX)*

- Coordinate locations with goals for the ADPs and Specific Area Master Plans
- Provide a minimum 10 ft. wide parking median for every six parking rows
- No dead end parking aisles
- Provide required number of automobile, bicycle, service vehicle, motorcycle and handicap accessible stalls *(See Table XXX)*
- In parking areas with 50 spaces or more,
  -Provide clearly marked accessible pedestrian routes, min. 6 ft. wide
- In parking areas with 100 spaces or more,
  - Coordinate design with transit system
  - Subdivide lots into smaller parking zones of 100 or less stalls. Use landscaped areas to separate the interior lots
  - Use end-of-row islands (minimum of 10 ft. wide) to define circulation lanes (maintain clear sight triangles in medians)
- In parking areas with 50 spaces or less,
  - Locate shuttle or transit pickup near the building and parking area
- Use end-of-row islands (minimum of 8 ft. wide) to define circulation lanes (maintain clear sight triangles in medians)
  - Provide min. 5 ft. wide sidewalks adjacent to parking area
  - Building setbacks can be reduced to less than 20 ft. if approved in the siting notification process

Setbacks

- Set back parking lots a minimum of 40 ft. from existing buildings (locate new buildings a minimum of 40 ft. from existing parking lots)
- Provide roadway setbacks according to the roadway standards

Entry Drives

- Provide two-way, 24 ft. wide driveway
- Avoid one-way entries and exits as they require two curb cuts at the street
- Provide visibility for safe entrance and exit of motorists in accordance with AASHTO standards for intersection visibility
- Provide a clear sight zone at intersections within the parking lot. The clear site zone is between 3 and 8 ft. above the gutter line and within an 11 ft. clear sight triangle *(See Figure XXX)*
- In areas with 100 spaces or more,
  - Define entry drives with 12 ft. wide landscaped medians on each side of the drive
  - Provide a minimum three car stacking length on entry drives

Emergency/Fire Access

- Design designated emergency and fire access lanes within parking lots to be:
  - 24 ft. wide if no parking is on either side
  - 30 ft. wide if parking is on one side
  - 36 ft. wide if parking is on both sides

Paving

- Pave permanent parking areas with asphalt, concrete, or pavers (pavers are preferable as they retain permeability and can be removed and repaired when necessary)
- Pave temporary or rarely used parking areas with gravel

Drainage

- Provide positive drainage off paved areas
- Drain surface flow into planted areas designed and planted to withstand occasional floodings
- Provide adjacent areas for stormwater detention and snow removal

Figure XXX: Large Parking Lot Layout - Plan

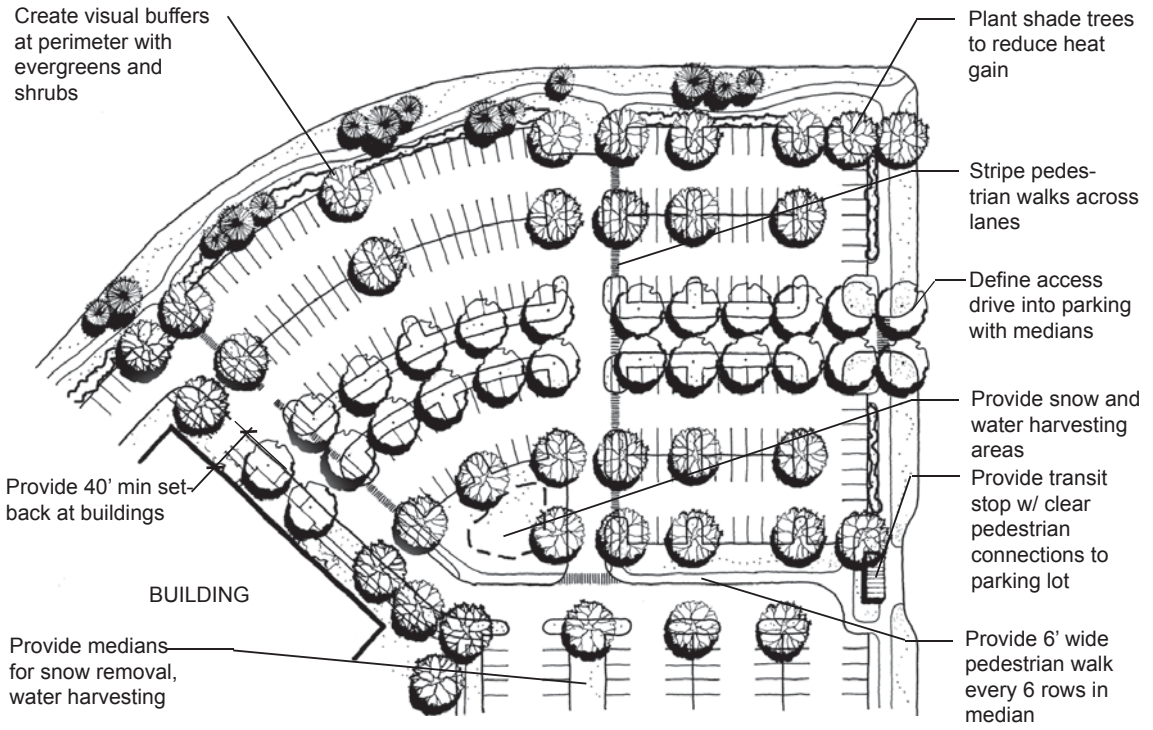


Figure XXX: Large Scale Parking - Existing

Figure XXX: Large Scale Parking - Applying Guidelines

General Parking Area Design Standards (continued)

Landscaping

- Screen parking areas from roadways with berms, trees, shrubs and/or walls
- Use planted medians to divide the parking lots into distinct sections and to accentuate entrances and the circulation pattern
- Provide a minimum of one (1) planting area for every ten (10) parking stalls. The planting area should be within the paved perimeter of the parking lot and be a minimum of 8 ft. wide by the length of the adjacent parking stall. Each planting area should be planted with one (1) deciduous shade tree and three (3) shrubs (see *center* and *edge* plants)
- Preserve existing trees to screen and shade parking lots where possible
- Use evergreen trees for visual screening only in locations where they will not cause icing problems within the parking lot

Figure XXX: Small Parking Lot Layout - Plan

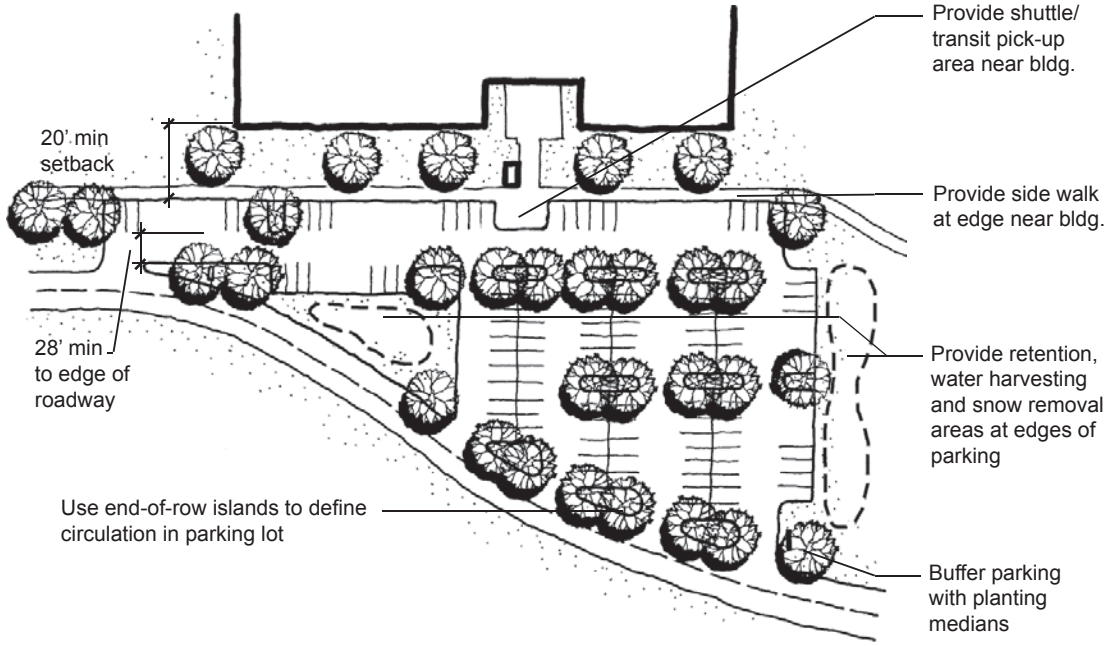


Figure XXX: Small Scale Parking - Existing

Figure XXX: Small Scale Parking Applying Guidelines

b. Parking Stall Design

- For recommended types, quantities, and layouts for parking stalls *See Tables XXX and XXX, and Figures XXX, XXX, XXX and XXX.*
- Stall arrangement shall be 90-degree parking stalls with two-way drive lanes, unless otherwise approved by Laboratory sitting process.
- Employee parking stall sizes anticipate less parking activity during a day. This standard should be used whenever parking is intended for longer stay daytime use.
- Visitor parking stall sizes are design for frequent in and out activity. This standard should be used whenever it is anticipated that a parking lot will have high parking turnover volume.

Table XXX: Parking Stall Design Standards

Stall Standards					
	Angle (degrees)	**Width** (ft.)	**Stall Length** (ft.)	**Number** Per 100 spaces. (Less than 100, use min. required)	**Location**
Standard - **Employee**	60	9	18	-	-
- **Long-term**	90	9	20	-	-
Compact	90	8	22	-	-
Accessible	-	13	20	See *Table XXX*	Max.150' entry
Visitors	-	9.5	20	determined by ???	Near entrances
Car Pool	-	-	-	5	Near entrances
Medical	-	-	-	1	Near entrances
Van Pool	-	-	-	5	Near entrances
Official Use	-	-	-	determined by ???	Near entrances
EZ-GO Cart	-	9	6	determined by ???	-
Motorcycle	-	4	8	2	-
Bicycles	-	2	6	10	Near entrances

Table XXX: Accessible Stalls Requirements

Accessible Space Requirements

Total Spaces	*Required Accessible Spaces*
1 - 25	1
26 - 35	2
36 - 50	3
51 - 100	4
100 - 300	8
301 - 500	12
501 - 800	16
801 - 1,000	20

Figure XXX: 90 Degree Parking Layout

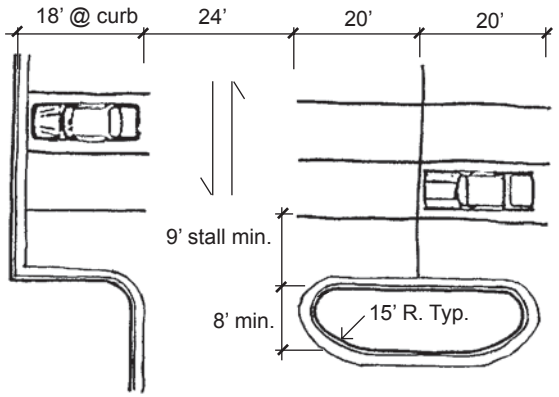


Figure XXX: Accessible Stalls / Section

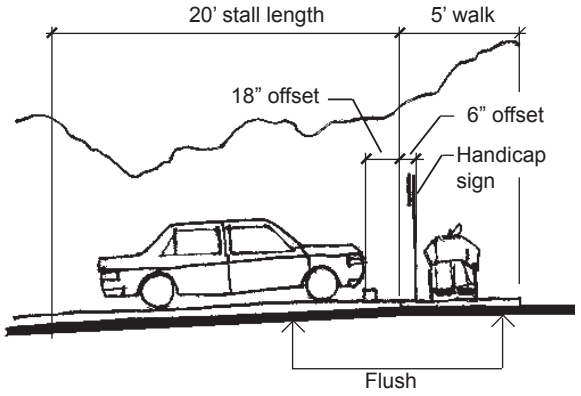


Figure XXX: 60 Degree Angled Parking Layout

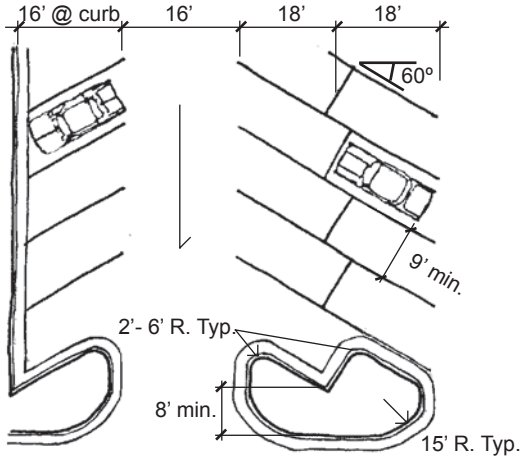
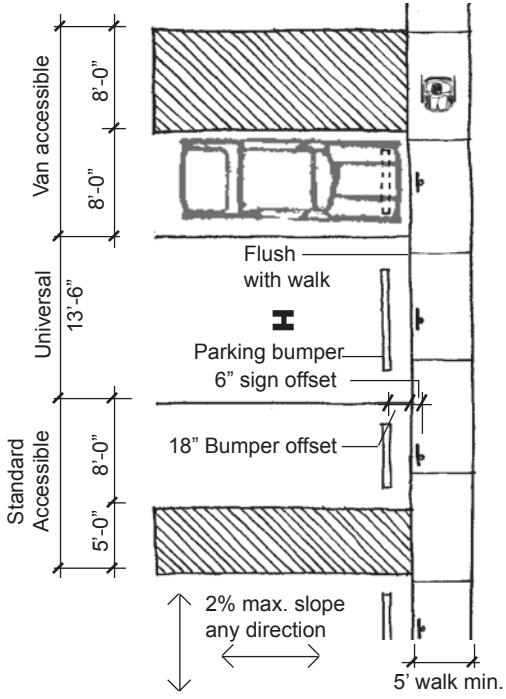


Figure XXX: Accessible Stalls Layout



d. Service Area Standards

Service areas are not parking areas but often include limited parking for deliveries and maintenance operations. Screening and limiting access to these areas, when possible, improves the visual appearance and safety of the Laboratory *(Figures XXX and XXX)*.

- Do not locate service areas at main entries (rear or sides of buildings are best)
- Share service and loading areas in building clusters whenever practical
- Design service areas to accommodate the largest service vehicles anticipated for regular use of docks or turnaround space (60 ft. outside wheel radius for truck turning layouts)
- Screen service areas where visible to roadways and pedestrian areas
- Trash enclosure design criteria are:
  - 142 sq. ft. minimum area
  - screen with solid masonry walls that are minimum of 5 ft. high and finished to be visually compatible with adjacent buildings
- install safety barriers to protect walls and utility equipment
- Design all service areas to accommodate fire apparatus access, positioning and turnaround per NFPA 1141
- Clearly mark pedestrian routes within service areas

Figure XXX: Service Areas

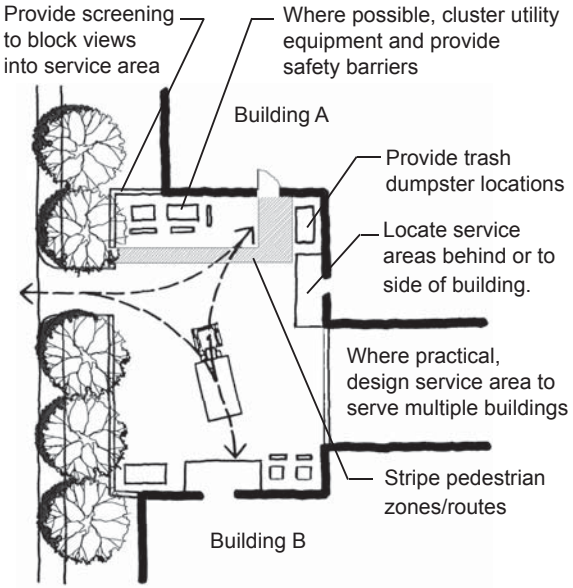
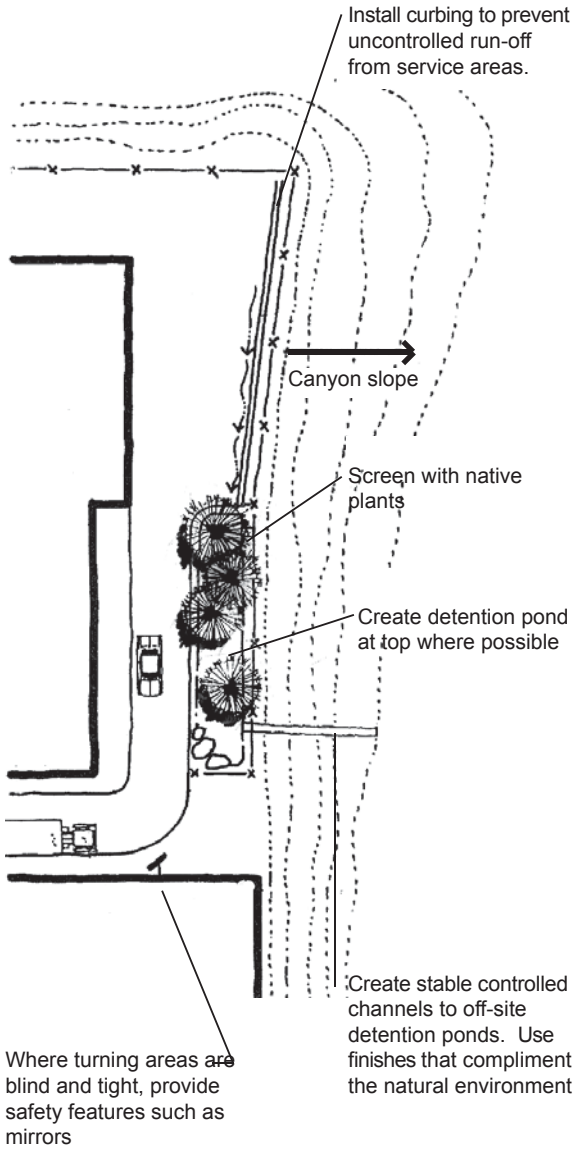


Figure XXX: Service Areas At Canyon Edges



c. Parking Structures

Parking is accommodated currently in surface lots at the Laboratory. As readily developable land is diminishing sitewide, structured parking will become an alternative more urban areas at the Laboratory.

Parking structures are planned in the TA-03 revitalization and proposed in the Integrated Facilities Planning long-range development. Well designed parking structures can contribute positively to the architectural appearance of the Laboratory.

Figures XXX, *XXX* and *XXX* are examples of well designed parking structures using different exterior materials.

Standards

- Site parking structures in accordance with the relevant Area Development Plan
- Design parking structures to compliment the architectural style of the surrounding buildings
- Provide security access controls on all or portions of a parking structure as required
- Parking sizes set forth in the Stall Standards *Table XXX* are the preferred standards within a parking structure

d. Parking - Runoff Control

e. Parking - Snow Storage

f. Parking - Transit Stop

Figure XXX: Parking Structure Example - concrete panel

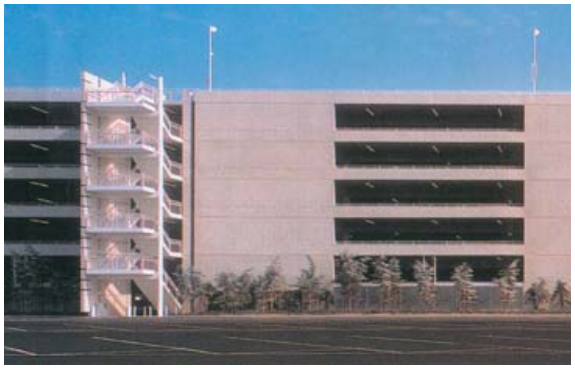


Figure XXX: Parking Structure Example - wire mesh panel

Figure XXX: Parking Structure Example - entryway

3. Transit

This section gives an overview of transit system needs and considerations at the Laboratory.

This section provides supplemental information for:

Table XXX, B.3 Circulation / Transit.

Transit Stops

a. Transit Stops

Transit is an important element in the Laboratory's circulation system. An efficient and easily accessible transit system reduces the need for parking and roads, improves air quality, and reduces energy consumption and traffic congestion.

Standards

- Transit improvements shall be designed as part of the overall circulation system for the Laboratory
- Implement transit facilities with new projects for sites, roads, parking and other site improvements
- Site and design transit stops and shelters to be highly visible, accessible and attractive in order to encourage use
- Insure that transit stops and vehicles accommodate individuals with disabilities
- Provide amenities such as shelters, benches, bike racks, newspaper dispensers, telephones, night lighting and trash receptacles *(Figure XXX).*
  Larger transit facility require more amenities *(Figure XXX).*
- Site transit stops to avoid excess heat gain in the summer and to protect from winter winds *(See Figure XXX for wind information).*

Figure XXX: Major Transit Stop Layout / Plan View

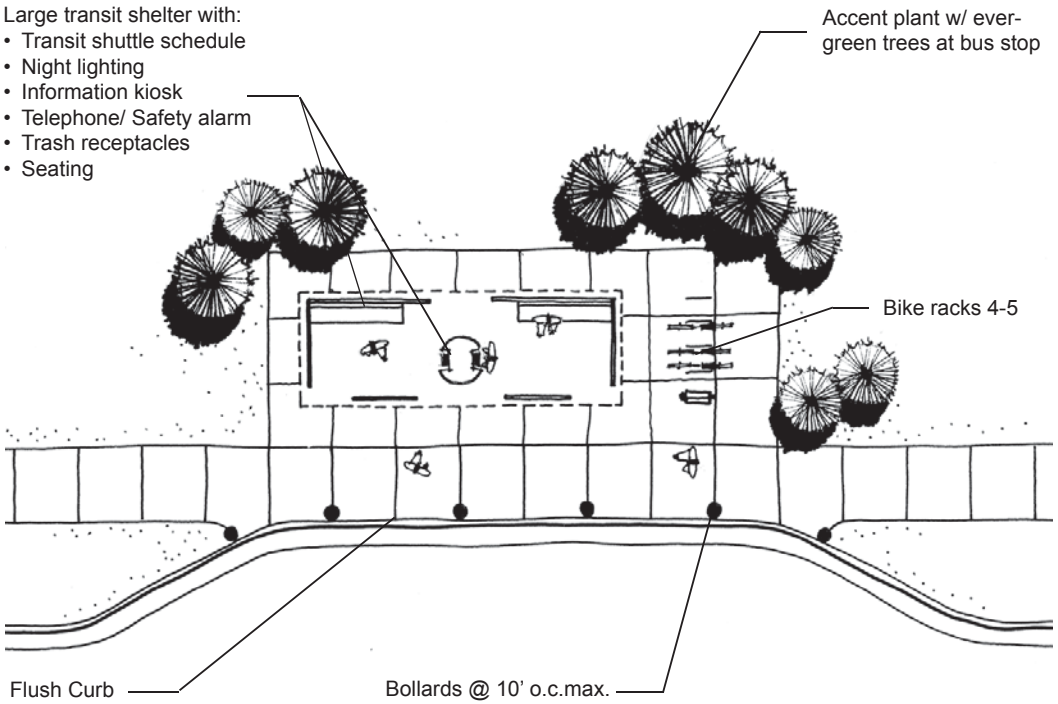
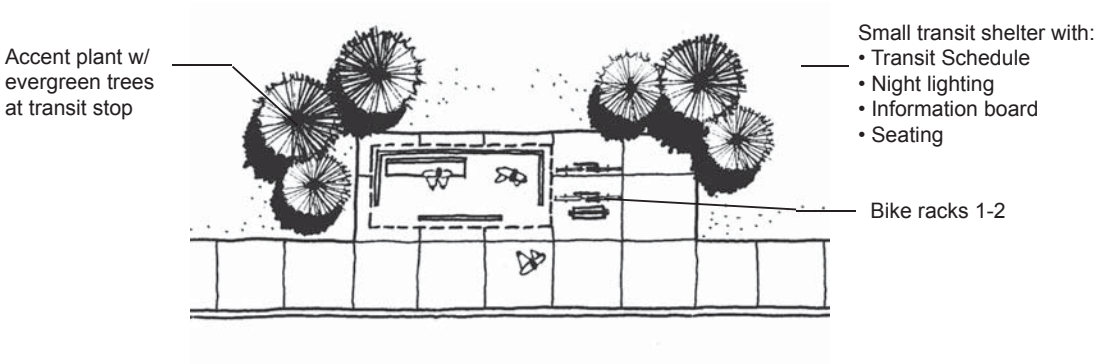


Figure XXX: Minor Transit Stop Layout / Plan View



4. Pedestrian and Bicycle Systems

Pedestrian and bicycle circulation encompasses all paths, trails and walks that link functions and uses at a human scale. These modes of circulation will become more important as density at the Laboratory increases and dependence on cars decreases. Safe, attractive and properly scaled pedestrian and bicycle circulation will encourage and enhance the pedestrian experience.

This section provides supplemental information for:

Table XXX, B.4 Circulation / Pedestrian and Bicycle +Systems

Multi-Modal Path Systems
Bicycle Systems
Pedestrian Systems
Trails

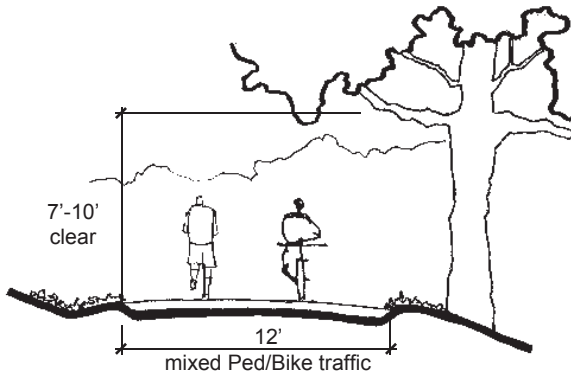
a. Multi-Modal Path Systems

Multi-Modal path systems accommodate various types of non-vehicular traffic, including bicycles, pedestrians and roller-bladers. These paths should be concentrated in center areas where the highest density of users occurs.

Standards

- Multi- modal path systems can be incorporated with utility maintenance access roads, secondary emergency routes and fire break lines
- Minimum 12 ft. wide trail
- Minimum 7 to 10 ft. clearance
- In center areas, one (1) deciduous tree shall be planted for every 30 linear feet of path

Figure XXX: Class 1 - Path (Multi-modal)



b. Bicycle Systems

Bicycles can be an effective alternate mode of transportation, especially when linked with transit services that have bicycle friendly amenities. Bicycle racks on transit vehicles are one such amenity. Transit vehicles with mounted bike racks allow a bicyclist to change to transit when weather is inclement or when distances are too great. There are three AASHTO classifications of bicycle lanes:

Class 1 - Path: trail or path physically separated from roadways as well as pedestrian walkways with minimal crossflow by motorists *(Figure XXX).*

Class 2 - Lane: designated bike lanes separated from adjacent motor vehicle traffic by separate lanes or striping (Figure XXX).

Class 3 - Route: designated bike route where motorists and bicycles share traffic lanes.

A bicycle path, lane or route shall be incorporated into any new roadway or roadway renovation project, especially where links can be made to exiting routes *(See Roads Classifications Table XXX for coordination.)* The class or route is dependent on location, traffic and potential users.

Best Practices

- Separate bike traffic from motorized vehicular traffic where possible.
- Separate bicycle and pedestrian traffic where possible. Design for the safety of both bicyclist and pedestrians when access is shared, *See Figure XXX.*
- Provide parking for bicycles near building entries, parking lots and transit stops (see site development standards).

Class 1 - Bicycle Path Standards

- Minimum 10 ft. wide trail
- Minimum 7 to 10 ft. clearance
- Enhance native vegetation and install xeric shrubs at intersections
- Use specialty paving or stripe intersections with pedestrian and vehicular circulation routes

Class 2 - Bicycle Lane Standards

- Minimum 6 ft. wide lane
- Clear signage designating lane
- Stripe pavement to separate vehicular traffic from bicycle traffic
- Use specialty paving or stripe intersections with pedestrian and vehicular circulation routes

Class 3 - Bicycle Route Standards

- Clear signage designating route
- Create links between bicycle paths and lanes

Figure XXX: Class 1 Bicycle Path

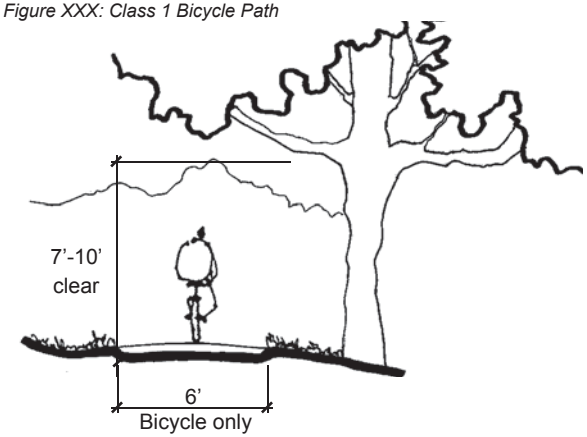
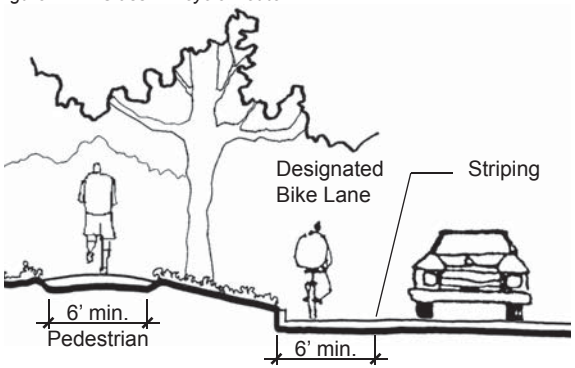


Figure XXX: Class 2 Bicycle Route



c. Pedestrian Systems

A well designed pedestrian system is a crucial component of circulation at Los Alamos National Labs. It requires the development of attractive, comfortable and safe pedestrian spaces and corridors to encourage walking. Walking allows for informal personal interactions that stimulate the exchange of information and ideas between staff.

The pedestrian system should be a complete looped and connected system that accommodates a variety of pedestrian activities, including jogging and hiking. It should connect major activity areas, link to other distant work sites and the adjacent community, and access the surrounding trails, natural canyons and forests. In addition, pedestrian plazas and courtyards should be located in relationship to major pedestrian corridors, building entries, and areas of concentrated pedestrian activities.

Circulation within the pedestrian system is composed of the following corridors and walkways:

- primary pedestrian corridors
- secondary corridors
- sidewalks
- corridor and walkway elements.

Primary Pedestrian Corridor

Primary pedestrian corridors are located in densely developed areas where population is more concentrated. Primary corridors serve areas that are free of vehicular traffic. Not every Tech Area will have a primary corridor.

- Place primary corridors within a minimum 50 ft. wide pedestrian corridor easement
- Provide a paved width of 12 to 20 ft., with 20 ft. being the preferred width
- Design primary corridors as primary emergency access and utility corridors. *(See Section XX Utilities and Utility Corridors.)*
- Where a corridor is designed as an emergency or fire access route, provide a minimum 20 ft. clear horizontal zone and maintain a 16 ft. vertical clearance above the corridor paving
- Use specialty paving on primary corridor intersection nodes
- Light corridors for safe nighttime use
- Design corridors with amenities to include seating, signage, trash receptacles, safety alarms, landscaping, bicycle furnishings, etc.
- Design corridors to meet Laboratory Facilities Engineering Manual requirements for accessibility

Secondary Pedestrian Corridor

Secondary pedestrian corridors in urban areas are important connecting walks between sets of buildings and the primary pedestrian corridors. In the more remote Tech Areas, secondary corridors may serve to connect a series of building complexes or developments.

- Place secondary corridors within a minimum 30 ft. wide pedestrian corridor easement
- Provide a minimum paved width of 10 ft. for secondary corridors
- Light corridors for safe night time use.
- Design corridors with amenities to include seating, signage, trash receptacles, exterior safety alarms, landscaping, bicycle furnishings, etc. (See landscape elements)
- Design corridors to meet Laboratory Facility Engineering Manual requirements for accessibility

Sidewalk Standards

Sidewalks are part of road improvements. The width and location of sidewalks is defined in the Road System section of this document.

Crosswalks

When pedestrian traffic crosses other circulation systems, clearly designated and marked crosswalks are required.

- Mark crosswalks with specialty paving or clearly visible painted stripes
- Match crosswalk width with that of the connecting walkway or with a minimum width of 6 ft.
- Install pedestrian crossing signals when crosswalks are at mid-block to alert vehicle drivers to the safety concern
- Provide curb-cut ramps at crosswalks
- Install street lighting at each crosswalk for nighttime visibility for both pedestrians and drivers
- Maintain a minimum 35 ft. clear sight triangle to provide pedestrians and drivers an unobstructed view at crosswalks
- Provide pavement markings and signage where walkways and bikeways intersect

Exterior Stair Standards

Stairs are required at steep grade changes on corridors and sidewalks (*Figure XXX)*.

- Exterior steps shall have riser heights between 5-7 inches with tread widths of 12-16 inches. A general formula is:
  2 risers + 1 tread = 26 inches
- Match stair width with the width of the corridor or sidewalk leading to them, or a minimum of 4 ft. wide
- Avoid stairs with less than two risers as they can present a safety hazard
- Maintain the same tread width and riser height for all steps in a set of stairs
- Provide steps with solid risers and rounded or chamfered nosing
- Light stairs and steps to ensure safe nighttime . . . use
- Provide a landing for every 5 ft. of elevation change in the stairs or every nine risers
- Design stairs to standards in the Laboratory Engineering Manual

Exterior Ramp Standards

Ramps provide wheelchair access where elevation changes occur. Ramps generally should be adjacent to or near stairways to provide a variety of access options.

- Design ramps to standards in the Laboratory Engineering Manuals
- Keep ramps at less than 1:20 slope
- The minimum width for ramps is 4 feet
- Light ramps for safe nighttime use

Figure XXX: Exterior Stairs

Figure XXX: Pedestrian System - Walkway Design Concept / TA-03 Core Area

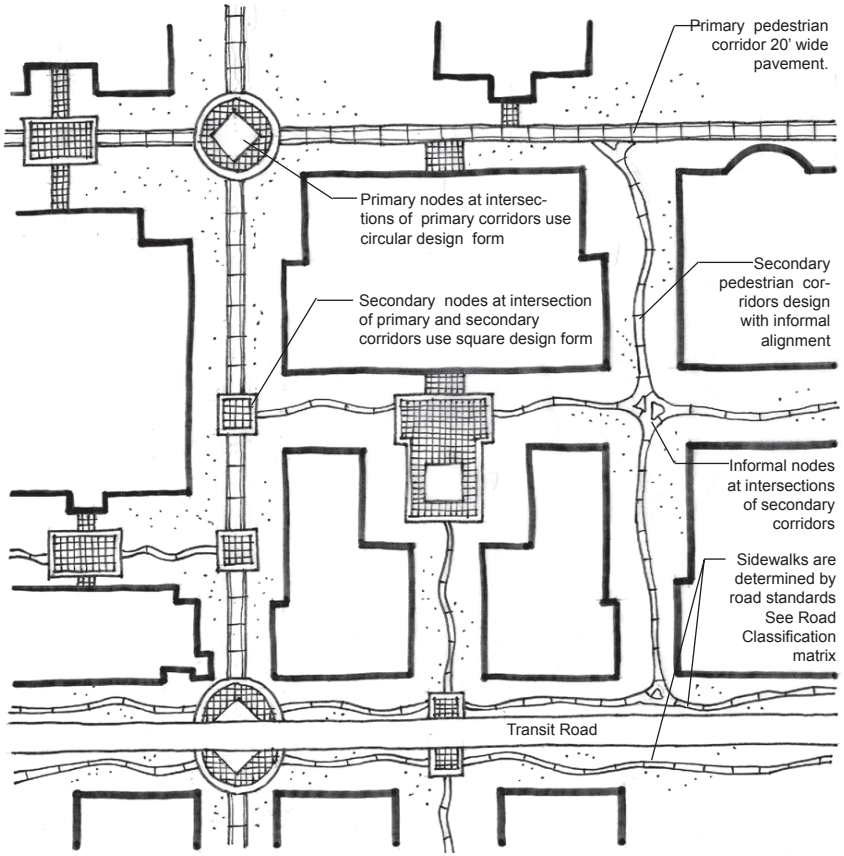
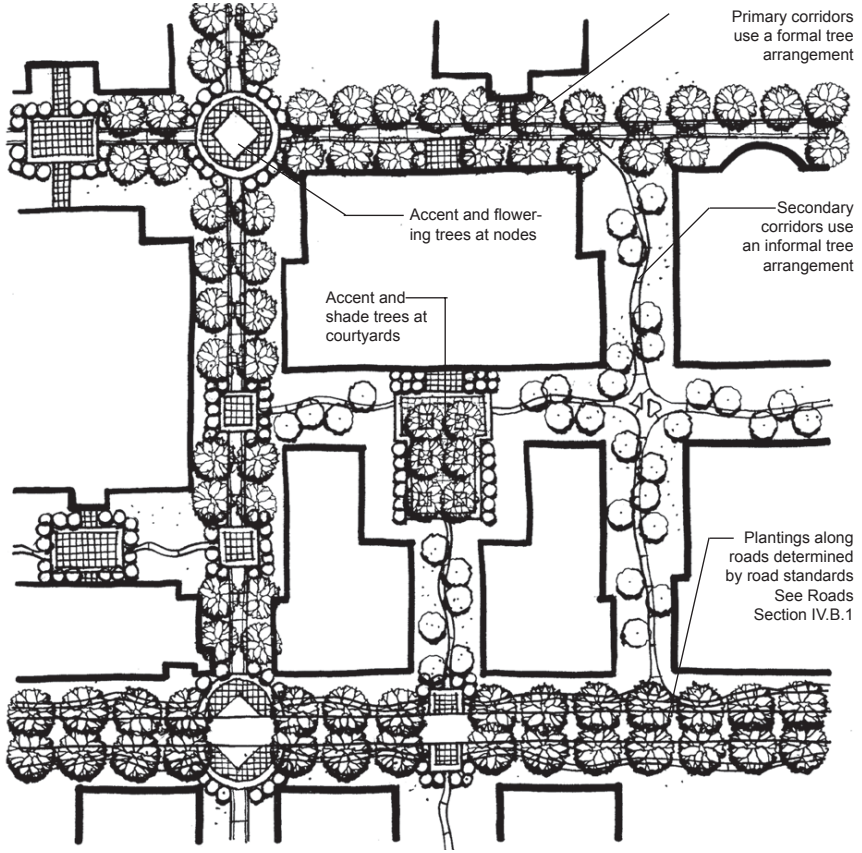


Figure XXX: Pedestrian System - Landscape Concept / TA-03 Core Area



Designing the Pedestrian System

Area Development Plans (ADPs) and Specific Area Master Plans propose the locations of activity and population centers at the Laboratory, and the conceptual layout of the pedestrian system to serve them.

The following example demonstrates how to apply the information from those plans to design the pedestrian system.

Figure XXX: Core Area Development Plan with Enlargement Area of TA-03

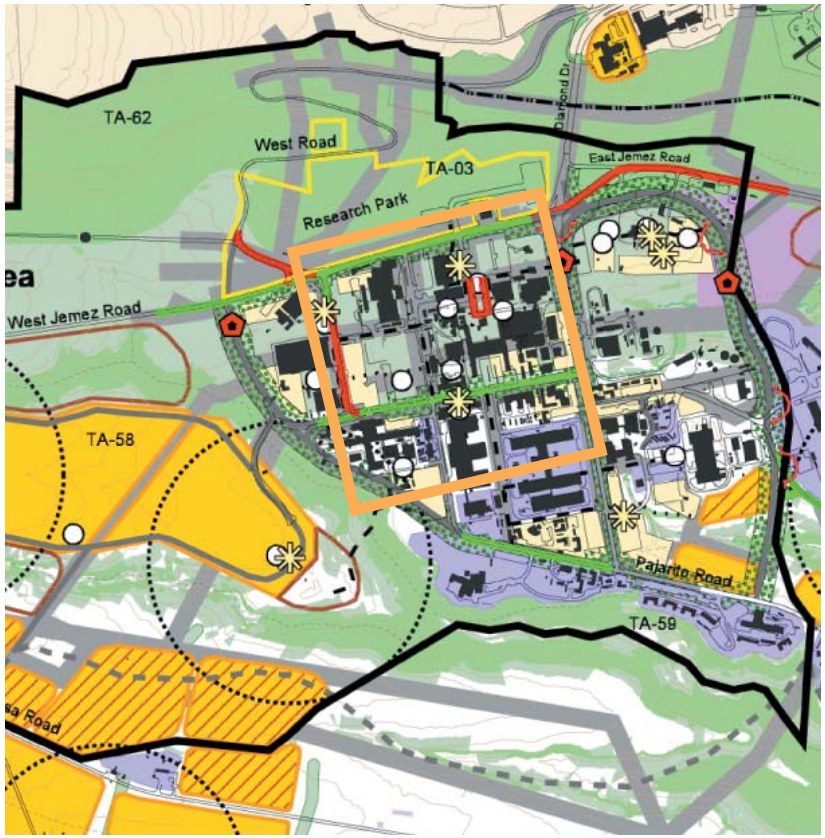


Figure XXX: Pedestrian System - Concept Diagram / TA-03 Core Area

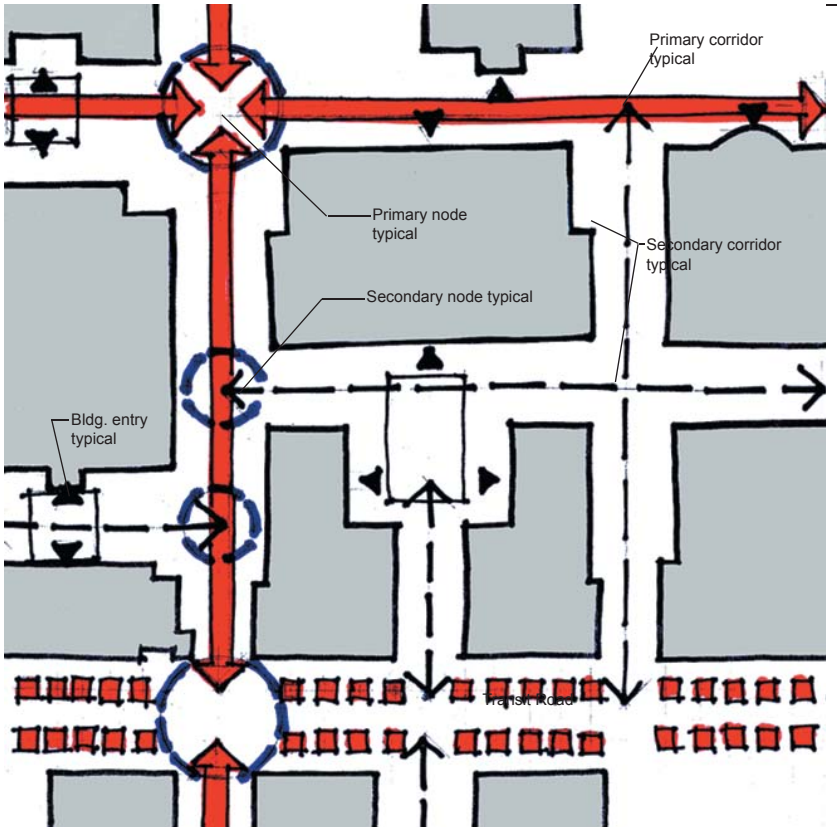


Figure XXX is an example from the ADP for the Core Planning Area. The area bounded by the orange line is an area in TA-03 where large building revitalization and development is now in process. This area is used in the following example.

Figure XXX extracts the conceptual walkway system based on the ADP guidance. The concept diagram establishes the hierarchy of walks anticipated for the area.

d. Trails

Trails are mostly located within the open and undeveloped areas of the Laboratory. They are often unpaved jogging and hiking routes. They provide recreational, health and wellness opportunities for Laboratory staff.

- Trail alignments can serve as firebreaks, utility maintenance access and secondary emergency access. Trails related to these accesses shall be 12 ft. wide
- Trail alignments shall be coordinated in the ADP's and Specific Area Master Plans
- New projects shall include trail improvements in the immediate area of the project
- The type of trail surface is selected based on the ability to maintain the trail surface and its frequency of use

Figures XXX, XXX and *XXX* are trail types in use at the Laboratory.

Figure XXX: Asphalt Trail - Section

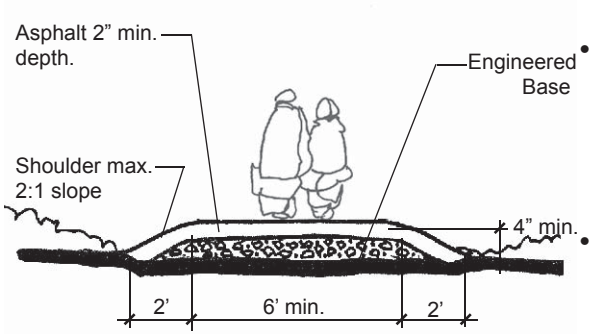


Figure XXX: Gravel Trail - Section

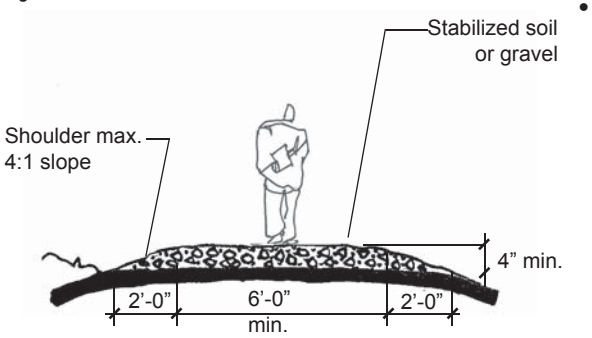
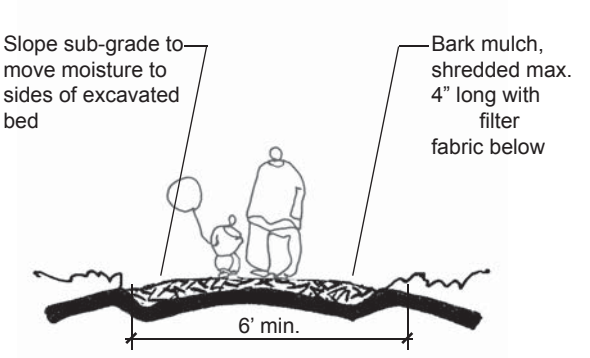


Figure XXX: Bark Mulch Trail - Section



Principles

To encourage use, the pedestrian system should emphasize the human scale and amenities including landscaping, seating, shelters, signage, lighting, and pedestrian security improvements.

Pedestrian spaces and corridors should be developed within each technical area as integral elements of the Area Development Plans and Specific Area Master Plans.

The pedestrian system should be separated from automobile and bicycle systems. Intersections with other circulation systems should be designed for safe pedestrian crossings.